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7/19/04

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
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APPEAL BRIEF OF ANOOP GHANWANI ET AL.
FOR
SYSTEM, DEVICE, AND METHOD FOR ESTABLISHING LABEL SWITCHED PATHS ACROSS MULTIPLE AUTONOMOUS DOMAINS

Serial No. 0473,103
Filed: December 28, 1999

Appeal from a decision of the Primary Examiner dated November 24, 2003
Technology Center 2141
Examiner Beatriz Prieto

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TABLE OF AUTHORITIES

Cases

I. Real Party in Interest

The real party in interest is Nortel Networks, Limited.

II. Related Appeals and Interferences

Appellants are not aware of any appeals or interferences that are related to the present case.

III. Status of the Claims

This is an appeal brief from a decision by the Primary Examiner November 24, 2003, rejecting claims 1-17, currently pending in the present application. No claims have been allowed. Claims 1-17 are the subject of this appeal.

A notice of Appeal was filed on February 24, 2004.

IV. Status of Amendments

In a final office action of April 4, 2003, claims 1-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over Armitage (U.S. Patent No. 6,347,303) in view of Aggarwal et al (U.S. Patent 6,330,614). On June 9, 2003, Appellants filed a response under 37 C.F.R. §1.116(a). In an advisory action of April 15, 2003, the Examiner indicated that the arguments filed in June were not persuasive. Appellants filed a Request for Continued Examination, to obtain entry of the response filed June 9, 2003. In a first final office action of November 24, 2003 the Examiner maintained the rejection of claims 1-17 under the combination of Armitage in view of Aggarwal.

V. Summary of the Invention

A. Background

In today's information age, communication devices, such as computers and computer peripherals, are often internetworked over a communication network. A common networking model routes packets of information within the communication network using a networking protocol such as the Internet Protocol (IP) or other network layer protocol. Some networking protocols, such as IP, are considered to be "connectionless" networking protocols. In a connectionless networking protocol, each packet of information includes a network layer address, and each router forwards the packet of information based upon the network layer address according to a predetermined routing protocol such as the Open Shortest Path First (OSPF) protocol, the Routing Information Protocol (RIP), Hello, or other routing protocol.

Thus, each router makes an independent forwarding decision for the packet based upon the network layer address. Essentially, each router partitions the entire set of network layer addresses into a number of Forwarding Equivalence Classes (FECs), and each FEC is mapped to a particular outgoing path (or set of paths, in the case of multi-path routing) based upon the routing protocol. The router determines an FEC for each packet of information based upon the network layer address of the packet, and forwards the packet of information to the corresponding outgoing path (or set of paths). Network layer routing requires each router to process each packet of information at the network layer. This is an expensive and time-consuming operation that limits the performance of some routers and even prevents certain devices that do not support the networking protocol from performing routing and other functions on the packets.

Label switching can be used to eliminate the network layer processing by certain devices in the communication network. Label switching enables a packet to be transported across a

network domain (referred to hereinafter as an "autonomous system" or "AS") using labels rather than the network layer address. Specifically, a Label Switched Path (LSP) is established from an ingress point border device to an egress point border device in the AS. The LSP traverses a number of label switching devices. Each label switching device assigns a short, fixed-length value (i.e., a "label") to each FEC that is supports. When the packet enters the ingress point border device, the ingress point border device uses the network address to assign the packet to a particular FEC, and inserts the corresponding label into the packet, specifically within a packet header. Each subsequent label switching device along the LSP uses the label in the packet to determine the next hop FEC for the packet, and replaces the label in the packet with a new label corresponding to the next hop PEC for the packet. The egress point border device removes the label from the packet. Thus, only the ingress point border device processes the packet at the network layer, and subsequent devices process the packet based upon the label only.

The Internet Engineering Task Force (IETF) Multi-Protocol Label Switching (MPLS) working group has defined an MPLS architecture for utilizing label switching for internetworking. MPLS is considered to be "multi-protocol" because it can be used with any network layer protocol, and is not limited to IP.

In order to use label switching for internetworking, each label switching device must learn the labels that are used by its neighboring label switching device(s). Each label switching device maintains a label information base (LIB) for mapping each FEC to a corresponding label. When the label switching device receives a packet including a label, the label switching device utilizes the LIB to map the received label to a next hop FEC and to retrieve a label for the next hop FEC. The label switching device then replaces the label in the packet with the label for the

next hop FEC, and forwards the resulting packet to the corresponding outgoing path (or set of paths).

In certain situations, it is desirable to use label switching for routing packets across multiple autonomous systems. Two neighboring autonomous systems share a common border device such that, with respect to a particular routing path, the shared border device is the egress point for one AS and the ingress point for the other AS. For convenience, the AS from which the shared border device receives the packet is referred to as the "incoming" AS, while the AS to which the shared border device forwards the packet is referred to as the "outgoing" AS.

In order to use label switching across autonomous systems, a two-tiered labeling scheme is employed. The ingress point border device in each AS establishes an LSP to the corresponding egress point border device within the AS. Whenever an ingress point border device forwards a packet, the ingress point border device inserts two labels (referred to hereinafter as a "label stack") into the packet, specifically within a packet header. One label (referred to hereinafter as a "border label") is a label associated with the egress point border device within the AS, which the egress point border device provides to the ingress point border device along with "reachability" information using a modified Border Gateway Protocol (BGP). The other label (referred to hereinafter as an "interior label") is a label associated with the next hop PEC for the packet, as described above. The location of the interior label within the packet header is the same whether or not the packet header includes a border label, and therefore intermediate devices process the packet in the same manner whether or not the packet header includes a border label. Within a particular AS, each interior (non-border) device processes the packet based upon the interior label, and replaces the interior label in the packet with a new interior label corresponding to the next hop FEC for the packet, as described above. The egress point border device removes the

border label and the interior label from the packet. If the egress point border device is also an ingress point for a neighboring AS, then the ingress point border device inserts a new border label and a new interior label into the packet. The new border label is a label associated with an egress point border device within the neighboring AS, and the interior label is a label associated with the next hop FEC for the packet.

Although the two-tier mechanism allows label switching to be used for routing packets across multiple autonomous systems, the two-tier mechanism has a number of disadvantages. One disadvantage is that the two-tier mechanism requires that BGP be modified or extended to distribute labels. Another disadvantage is that the label stack adds a substantial amount of overhead per packet.

Thus, a mechanism for using label switching across autonomous systems that does not utilize a label stack and does not require any modifications to BGP would be valuable.

B. Appellants' Invention

In accordance with one aspect of the invention, a label switched path is established across multiple autonomous systems by establishing a label switched path in each autonomous system, and, at each shared border device, linking an incoming label switched path in an incoming autonomous system to an outgoing label switched path in an outgoing autonomous system. The Label Distribution Protocol is preferably used to establish the label switched path between border devices in each autonomous system. Each border device maps a label associated with the incoming label switched path to a label associated with the outgoing label switched path. When a border device receives a protocol message including the label associated with the incoming label switched device, the border device replaces the label in the protocol message

with the label associated with the outgoing label switched path, and forwards the protocol message to the downstream neighboring (next hop) device in the outgoing autonomous system.

By using the Label Distribution Protocol to establish the label switched path within each autonomous system, a label switched path is established across multiple autonomous systems without requiring any modifications to BGP for carrying label information. Also, by having each border device "link" an incoming label switched path from an incoming autonomous system to an outgoing label switched path in an outgoing autonomous system.

VI. Issues

A. Whether claims 1-17 were properly rejected under 35 U.S.C. §103(a) as being unpatentable over Armitage (U.S. 6,347,303) in view of Aggarwal et al (U.S. Patent 6,330,614).

VII. Grouping of Claims

Claims 1-17 do not stand or fall together. Claims 3 and 4 stand and fall with claim 1. Claim 5 stands and falls with claim 2. Claims 8 and 9 stand and fall with claim 6. Claim 10 stands and falls with claim 7. Claims 13 and 14 stand and fall with claim 11. Claim 15 stands and falls with claim 12. Claims 16 and 17 each stand alone.

VIII. Argument

A. The Examiner has failed to establish a prima facie case of obviousness under 35 U.S.C. §103(a) of claims 1-17 as being unpatentable over Armitage in view of Aggarwal.

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations." M.P.E.P. §2143.

Armitage, U.S. Patent 6,347,303

Armitage describes a negotiative protocol by which Label Switched Paths (LSPs) can be explicitly established using a defined distribution protocol. Portions of a label are defined by an upstream neighbor in an adjacent pair of Label Switched Routers (LSRs) by having the upstream neighbor provide a bit mask, indicating which portions of the label are to be assigned by the downstream neighbor. If all bits of the bit mask are zero, the label is fully determined by the upstream neighbor, otherwise any bit mask is set-able by the downstream neighbor. Armitage states, at col. 3, lines 31-33 "... On receiving a label bind from a downstream neighbor 20, an LSR may immediately splice this label to labels it has provided, or will provide, to its upstream neighbor..." (See also, Figure 4, step 21).

Claim 7 of Armitage recites the steps of: "... removing said routing label attached to a stream of data packets at said first label routing router, at an adjacent one of said label routing router which assigned said last mentioned router label to said first label routing router, before the stream of data packets travels on to another label routing router that is not adjacent to said first label routing router...adding a different routing label onto said last mentioned stream of data

packets received at said adjacent one of said label routing routers to replace the routing label removed thereat, said different label routing router adjacent to said last mentioned adjacent label routing router, but not adjacent to said first label routing router, and associated with routing labels assigned by said adjacent one of said label routing routers to said first label routing router and subsequently received..." In essence, the claim states that a router B, disposed between two routers A and C, uses a different label to communicate with a router A than it uses to communicate with a router C.

Aggarwal: U.S. Patent 6,330,614:

Aggarwal describes a technique for re-using the checksum field space in the header in the current Internet or private IP networks for increasing the processing speed of Internet datagrams. Aggarwal describes combining a group of Routers into Autonomous Systems (AS), and assigning the same unique number to all routers in the system (col. 11, lines 41-43). The AS field is stored in the checksum field, and core routers forward datagrams by using the AS number stored in the checksum field, *in addition to the regular IP address* of the network device. (Since the AS field is used to designate a group of routers, some sort of address is still required to identify the destination device of an AS).

Aggarwal states, at col. 11, lines 55-68:

> "... When EGP Cloud 1 learns network addresses from Network B, it will advertise these addresses to EGP Cloud 2. EGP Cloud 2 would now associate AS number X in its forwarding table entry for network addresses learned from EGP Cloud 2. *If all Routers used this invention, then Edge Routers would insert AS numbers in the Checksum field and every router in the network would associate an egress port per AS number.* If some host on network Y wants to communicate with another host on Network B, Fig. 10, then the first Router in EGP Cloud 2 would examine the AS number in the Checksum Field within one memory lookup would know to forward it to EGP Cloud 1. When the datagram reaches EGP Cloud 1, the first router would know that the destination is

connected to its own network, and then it would start to forward, based on the destination network in the IP header..."

Appellants note that no mention, suggestion or description is made in Aggarwal of replacing labels as AS boundaries are crossed.

1). **No motivation for the modification suggested by the Examiner is shown or suggested by the references**

It is well established that in order to support a rejection under 35 U.S.C. §103, sufficient motivation for combining the references to teach the claimed invention must be provided by the Examiner. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

Appellants submit that there is no motivation for the modification suggested by the Examiner, *because the prior art explicitly states the undesirability of the use of MPLS labels*. Although the Examiner relies on the Abstract of Aggarwal to support the fact that Aggarwal does not teach away from MPLS, the Examiner is ignoring the explicit teachings of Aggarwal. In the Abstract, Appellants note, Aggarwal does not say that it supports MPLS, but that it supports "MPLS-type" protocols. The system of Aggarwal explicitly states "... using the invention, the creating of a new protocol as defined by MPLS is avoided, and instead the current IP header may be used to accomplish the same function..." Thus, Appellant maintains their posture that Aggarwal teaches away from the use of labels as used in Armitage, and there would be no motivation for the combination of the two references.

It is well established that the test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art, and all teachings in the prior art must be considered to the extent that they are in analogous arts. Where the teachings of two or more prior art references conflict, the examiner must weigh the power of each reference to suggest solutions to one of ordinary skill in the art, considering the degree ***to which one reference might accurately discredit another.*** *In re Young*, 927 F.2d 588, 18 USPQ2d 1089 (Fed. Cir. 1991)

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) Appellants submit that the proposed modification suggested by the Examiner changes the principle of operation of Aggarwal, which seeks a method of operation without MPLS labels, and thus the modification is improper and cannot stand.

Appellants submit that the Examiner is not giving weight to the goal of Aggarwal, which is explicitly stated at column 12 as "use of the invention for eliminating MPLS headers..." Accordingly, because there is no motivation for the combination of references, Appellant submits that the rejection of claims 1-17 under 35 U.S.C. §103 is improper and should be withdrawn.

2). **The recited elements and relationships are not suggested by the combination of references**

Under 35 U.S.C. §103, To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

(a.) Claims 1 and 3-4, 6 and 8-9, 11 and 13-14, 16 and 17:

The combination of references neither describes nor suggests all the limitations in the claims, and as such should be withdrawn. For example, as will be described in more detail below, the combination fails to teach or suggest the limitation of : "...a first label from an upstream neighboring device is mapped to a second label from a downstream neighboring device..." wherein the upstream neighboring device and downstream device are in different autonomous systems.

(1). Claims 1, 3 and 4:

Claim 1 recites "... A method for establishing a label switched path across multiple autonomous systems, the method comprising ... *mapping a first label from a first autonomous system to a second, label in a second autonomous system*; receiving from said first autonomous system a protocol message including said first label;

replacing said first label with said second label in said protocol message; and forwarding said protocol message to a downstream neighboring (next hop) device in said second autonomous system..."

The Examiner states "... Armitage teaches... mapping... receiving ... swapping ... and forwarding... however, the prior art of record does not explicitly teach wherein said upstream and downstream neighboring devices are in respective first and second autonomous systems..." "Aggarwal teaches a system ... related to using a Label distribution Protocol to establish label switched paths ... *wherein a first label from an upstream neighboring device is mapped to a second label from an downstream neighboring device in a second autonomous system* (Fig. 10) (col. 11 lines 51 – col 12 line 12, lookup mapping, col 4 lines 54 – col. 5 line 16).

Appellants respectfully disagree with the Examiners position that Aggarwal teaches "wherein a first label from an upstream neighboring device is mapped to a second label from a downstream neighboring device...". The portion of text cited by the Examiner at col. 11, lines 51-col. 12 line 12 recites merely that "If some host on network Y wants to communicate with another host on network B, Fig. 10, then the first Router in EGP Cloud 2 would examine the AS number in the checksum Field and within one memory lookup would know to forward it towards EGP Cloud 1. When the datagram reaches EGP cloud 1, the first router would know that the destination is connected to its own network and then it would forward, based on the destination network in the IP header..." In Aggarwal, there is no 'second label', rather the 'first label' is used at the destination node as an identifier, and the IP address adds further delineation.. In effect, what Aggarwal teaches is the use of a stacked address, which includes a label for the

autonomous system and the node within the system. (Further support for this inference is found at column 12, where Aggarwal mentions the use of IP stacking).

The situation of Aggarwal is one which is overcome through the application of the present invention. As stated at page 4, lines 8-11 of the instant specification "One disadvantage is that the two-tier mechanism requires that BGP be modified or extended to distribute labels. Another disadvantage is that the label stack adds a substantial amount of overhead per packet..."

The present invention overcomes the problems of the prior art, such as Aggarwal, which uses two tiers of addressing (an AS as well as an internal IP address) to locate a node. [Aggarwal states explicitly at column 11, lines 40-44 "In the Core of the Internet, Routing Control Protocols , e.g., BGP, combine a group of Autonomous Systems (AS) and *assigns the same unique number to all routers in the system*..." At column 12, lines 1-5 Aggarwal states "When the datagram reaches the EGP Cloud 1, the first router would know that the destination is connected to its own network and then it would start to forward, *based on the destination network in the IP header*..."]

It would appear to the Appellant that the Examiner is not giving patentable weight to the term 'Autonomous Systems', as recited in the claimed invention. At issue is whether internetworking (between individual routers) is the same as intra-networking (between different domains of routers). Given that different protocols are provided for handling each of the different types of communications, it is evident to the Appellant that the two types of communications are not the same, and thus patentable weight must be given to the Appellants use of the term 'autonomous systems'.

Because patentable weight must be given to this term, Appellant's submit that the combination of the two neither describes nor suggests the claimed invention. The only disclosed method of propagating intra-domain 'labels' is in Aggarwal. Thus, the only proper combination of references incorporates the teachings of Armitage with regard to labels into the system of Aggarwal, and would still result in a label stacked result. Any other combination does not properly take into effect the patentable weight of the term 'autonomous systems', and thus cannot be supported.

In the previous response, the Appellant provided a similar argument as put forth above. In response to this argument, the Examiner stated, at page 5 of the office action of April 4, 2003:

"... In response to Appellant's argument that the references fail to show certain features of Appellant's invention, it is noted that the features upon which Appellant relies (where an AS and IP address are used to cross AS boundaries...)... are not recited in the rejected claims..."

In response to this statement, Appellants submit that the Examiner mis-read the previous response; for the record, Appellant's *never* stated that any such element was part of the instant invention, but were reciting what Appellant viewed as the only permissible combination of Aggarwal and Armitage. Closer reading of the response clearly shows, also, that Appellant dealt with the combination of references, rather than the references individually, as asserted by the Examiner.

Accordingly, because the combination of Armitage and Aggarwal fail to teach the limitations of Claim 1, claim 1 is patentably distinct over the references and the

rejection should be withdrawn. Claim 3 serves to further limit claim 1 and is allowable for at least the reasons put forth above with regard to claim 1.

(2). Claims 6, 8 and 9:

Claim 6 includes limitations similar in scope to those described as patentable in claim 1. For example, claim 6 is directed to "...A device for establishing a label switched path across multiple autonomous systems, the device comprising ... mapping logic operably coupled *to map a first label from a first autonomous system to a second label in a second autonomous system* ... receiving logic operably coupled to receive from said first autonomous system a protocol message including said first label ... replacing logic responsive to the receiving logic and operably coupled to replace said first label with said second label in said protocol message; and ...forwarding logic responsive to the replacing logic and operably coupled to forward said protocol message to a downstream neighboring (next hop) device in said second autonomous system..."

Thus, for reasons similar to those put forth above with regard to claim 1, (i.e., that the combination of references does not teach mapping a first label from a first autonomous system to a second autonomous system...") the rejection is improper and should be withdrawn. Claims 8 and 9 serve to further limit claim 6 and are allowable for at least the reasons put forth above with regard to claim 6.

(3). Claims 11, 13 and 14:

Claim 11 includes limitations similar in scope to those described as patentable in claim 1. For example, claim 11is directed to "...A program product comprising a

computer readable medium having embodied therein a computer program for establishing a label switched path across multiple autonomous systems, the computer program comprising mapping logic programmed to map a first label from a first autonomous system to a second label in a second autonomous system ...receiving logic programmed to receive from said first autonomous system a protocol message including said first label ... replacing logic responsive to the receiving logic and programmed to replace said first label with said second label in said protocol message; and ... forwarding logic responsive to the replacing logic and programmed to forward said protocol message to a downstream neighboring (next hop) device in said second autonomous system..."

Thus, for reasons similar to those put forth above with regard to claim 1, (i.e., that the combination of references does not teach mapping a first label from a first autonomous system to a second autonomous system...") the rejection is improper and should be withdrawn. Claims 13 and 14 serve to further limit claim 11 and are allowable for at least the reasons put forth above with regard to claim 11.

(4). Claim 16:

Claim 16 includes limitations similar in scope to those described as patentable in claim 1. For example, claim 16 is directed to "...A communication system comprising a plurality of autonomous systems, each autonomous system having at least a border device that is shared with another autonomous system, wherein the shared border device links an incoming label switched path from an incoming autonomous system to an outgoing label switched path in an outgoing autonomous system..."

Thus, for reasons similar to those put forth above with regard to claim 1, (i.e., that the combination of references does not teach mapping a first label from a first autonomous system to a second autonomous system...") the rejection of claim 16 is improper and should be withdrawn.

(5). Claim 17:

Claim 17 includes limitations similar in scope to those described as patentable in claim 1. For example, claim 17 is directed to "...An information base comprising at least one entry mapping a first label from a first autonomous system to a second label in a second autonomous system...."

Thus, for reasons similar to those put forth above with regard to claim 1, (i.e., that the combination of references does not teach mapping a first label from a first autonomous system to a second autonomous system...") the rejection of claim 16 is improper and should be withdrawn.

b). <u>Claims 2 and 5, 7 and 10, 12 and 15</u>:

(1). Claims 2 and 5:

Claim 2 recites the steps of "...establishing an incoming label switched path over said first autonomous system ... *associating said first label with said incoming label switched path* ... establishing an outgoing label switched path over said second autonomous system ... learning said second label associated with said downstream neighboring (next hop) device in said second autonomous system ... *mapping said first label from said autonomous system to said second label in said second autonomous system* ... receiving from said first autonomous system said protocol message including

said first label ... *replacing said first label with said second label in said protocol message; and forwarding said protocol message to said downstream neighboring (next hop) device in said second autonomous system....*"

As mentioned above with regard to claim 1, the steps of 'mapping said first label from said autonomous system to said second label in said autonomous system' , and 'replacing said first label with said second label ' are not supported by the combination of Aggarwal and Armitage. For at least these reasons, claim 2 is patentably distinct over the combination of references, and the rejection should be withdrawn. Claim 5 serves to further limit claim 2 and is allowable for at least the reasons put forth with regard to claim 2.

(2). Claims 7 and 10:

Claim 7 includes limitations similar in scope to claim 2. For example, claim 7 includes the elements of "...*first label switched path establishing logic operably coupled to establish an incoming label switched path over said first autonomous system and associate said first label with said incoming label switched path* ... second label switched path establishing logic responsive to said first label switched path establishing logic and operably coupled to establish an outgoing label switched path over said second autonomous system ... label distribution logic operably coupled to obtain said second label from said downstream neighboring (next hop) device in said second autonomous system ... *mapping logic operably coupled to map said first label from said first autonomous system to said second label in said second autonomous system ... receiving logic operably coupled to receive from said first autonomous system said protocol message including said first label ...replacing logic responsive to said receiving logic*

and operably coupled to forward said protocol message to said downstream neighboring (next hop) device in said second autonomous system...."

Thus, for at least the reasons put forth above with regard to claim 2, claim 7 is patentably distinct over the combination of Armitage and Aggarwal. Claim 10 serves to further limit claim 7 and is allowable for at least the reasons put forth with regard to claim 7.

(3). Claims 12 and 15:

Claim 12 includes limitations similar in scope to claim 2. For example, claim 12 includes the elements of "...first label switched path establishing logic programmed to establish an incoming label switched path over said first autonomous system and associate said first label with said incoming label switched path ... second label switched path establishing logic responsive to said first label switched path establishing logic and programmed to establish an outgoing label switched path over said second autonomous system... label distribution logic programmed to obtain said second label from said downstream neighboring (next hop) device in said second autonomous system *...mapping logic programmed to map said first label from said first autonomous system to said second label in said second autonomous system ... receiving logic programmed to receive from said first autonomous system said protocol message including said first label ... replacing logic response to said receiving logic and programmed to replace said first label with said second label in said protocol message; and forwarding logic responsive to said replacing logic and programmed to forward said protocol message to said downstream neighboring (next hop) device in said second autonomous system..."*

Thus, for at least the reasons put forth above with regard to claim 2, claim 12 is patentably distinct over the combination of Armitage and Aggarwal. Claim 15 serves to further limit claim 12 and is allowable for at least the reasons put forth with regard to claim 12.

IX. Conclusion

Appellant submits therefore that the rejection of claims 1-17 under 35 U.S.C. § 103 is improper for failing to provide a motivation for modifying the references as suggested by the Examiner and further for failure to provide a combination that teaches all elements of the claims. Thus, Appellants respectfully request that the rejection of the claims be withdrawn, and the claims be allowed.

Respectfully submitted,

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APPENDIX A

CLAIMS

1. (previously amended) A method for establishing a label switched path across multiple autonomous systems, the method comprising:

mapping a first label from a first autonomous system to a second label in a second autonomous system;

receiving from said first autonomous system a protocol message including said first label;

replacing said first label with said second label in said protocol message; and

forwarding said protocol message to a downstream neighboring (next hop) device in said second autonomous system.

2. (original) The method of claim 1, comprising:

establishing an incoming label switched path over said first autonomous system;

associating said first label with said incoming label switched path;

establishing an outgoing label switched path over said second autonomous system;

learning said second label associated with said downstream neighboring (next hop) device in said second autonomous system;

mapping said first label from said autonomous system to said second label in said second autonomous system;

receiving from said first autonomous system said protocol message including said first label;

replacing said first label with said second label in said protocol message; and

forwarding said protocol message to said downstream neighboring (next hop) device in said second autonomous system.

3. (original) The method of claim 2, wherein establishing said outgoing label switched path over said second autonomous system comprises:

using a Label Distribution Protocol to set up said outgoing label switched path to a downstream neighboring border device.

4. (original) The method of claim 2, wherein learning said second label associated with said downstream neighboring (next hop) device in said second autonomous system comprises:

establishing a Label Distribution Protocol session with said downstream neighboring (next hop) device; and

receiving said second label associated with said downstream neighboring (next hop) device in said second autonomous system via said Label Distribution Protocol session.

5. (original) The method of claim 2, wherein mapping said first label from said first autonomous system to said second label in said second autonomous system comprises:

maintaining a label information base; and

creating in said label information base a label information base entry mapping said first label from said first autonomous system to said second label in said second autonomous system.

6. (original) A device for establishing a label switched path across multiple autonomous systems, the device comprising:

mapping logic operably coupled to map a first label from a first autonomous system to a second label in a second autonomous system;

receiving logic operably coupled to receive from said first autonomous system a protocol message including said first label;

replacing logic responsive to the receiving logic and operably coupled to replace said first label with said second label in said protocol message; and

forwarding logic responsive to the replacing logic and operably coupled to forward said protocol message to a downstream neighboring (next hop) device in said second autonomous system.

7. (original) The device of claim 6, comprising:

first label switched path establishing logic operably coupled to establish an incoming label switched path over said first autonomous system and associate said first label with said incoming label switched path;

second label switched path establishing logic responsive to said first label switched path establishing logic and operably coupled to establish an outgoing label switched path over said second autonomous system;

label distribution logic operably coupled to obtain said second label from said downstream neighboring (next hop) device in said second autonomous system;

mapping logic operably coupled to map said first label from said first autonomous system to said second label in said second autonomous system;

receiving logic operably coupled to receive from said first autonomous system said protocol message including said first label;

replacing logic responsive to said receiving logic and operably coupled to forward said protocol message to said downstream neighboring (next hop) device in said second autonomous system.

8. (original) The device of claim 7, wherein said second label switched path establishing logic comprises Label Distribution Protocol logic.

9. (original) The device of claim 7, wherein said label distribution logic comprises Label Distribution Protocol logic operably coupled to establish a Label Distribution Protocol session with said downstream neighboring (next hop) device and receive said second label associated with said downstream neighboring (next hop) device in said second autonomous system via said Label Distribution Protocol session.

10. (original) The device of claim 7, further comprising a label information base, wherein said mapping logic is operably coupled to create in said label information base a label information base entry mapping said first label from said first autonomous system to said second label in said second autonomous system.

11. (original) A program product comprising a computer readable medium having embodied therein a computer program for establishing a label switched path across multiple autonomous systems, the computer program comprising:

mapping logic programmed to map a first label from a first autonomous system to a second label in a second autonomous system;

receiving logic programmed to receive from said first autonomous system a protocol message including said first label;

replacing logic responsive to the receiving logic and programmed to replace said first label with said second label in said protocol message; and

forwarding logic responsive to the replacing logic and programmed to forward said protocol message to a downstream neighboring (next hop) device in said second autonomous system.

12. (original) The program product of claim 11 comprising:

first label switched path establishing logic programmed to establish an incoming label switched path over said first autonomous system and associate said first label with said incoming label switched path;

second label switched path establishing logic responsive to said first label switched path establishing logic and programmed to establish an outgoing label switched path over said second autonomous system;

label distribution logic programmed to obtain said second label from said downstream neighboring (next hop) device in said second autonomous system;

mapping logic programmed to map said first label from said first autonomous system to said second label in said second autonomous system;

receiving logic programmed to receive from said first autonomous system said protocol message including said first label;

replacing logic response to said receiving logic and programmed to replace said first label with said second label in said protocol message; and

forwarding logic responsive to said replacing logic and programmed to forward said protocol message to said downstream neighboring (next hop) device in said second autonomous system.

13. (original) The program product of claim 12, wherein said second label switched path establishing logic comprises Label Distribution Protocol logic.

14. (original) The program product of claim 12, wherein said label distribution logic comprises Label Distribution Protocol logic programmed to establish a Label Distribution Protocol session with said downstream neighboring (next hop) device and receive said second label associated with said downstream neighboring (next hop) device in said second autonomous system via said Label Distribution Protocol session.

15. (original) The program product of claim 12, wherein said mapping logic is programmed to maintain a label information base and to create in said label information base a label information base entry mapping said first label from said first autonomous system to said second label in said second autonomous system.

16. (original) A communication system comprising a plurality of autonomous systems, each autonomous system having at least a border device that is shared with another autonomous system, wherein the shared border device links an incoming label switched path from an incoming autonomous system to an outgoing label switched path in an outgoing autonomous system.

17. (original) An information base comprising at least one entry mapping a first label from a first autonomous system to a second label in a second autonomous system.